



HCAL DQM

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Joint DPG-Physics meeting on Jets and MET, 16.04.2008



HCAL DQM



- Tasks of the HCAL DQM:
 - Fast feedback to experts (is the detector okay or is there something wrong with the hardware/electronics/settings ?)
 - Offline DQM for proper reconstruction
 - Long term stability of the detector
- Types of HCAL DQM (and contacts):
 - HLT-DQM
 - Online DQM (Lisa Berntzon, Jason St.John)
 - Offline DQM (Lisa Berntzon, Jason St.John)
 - Prompt analysis (Lisa Berntzon, Efe Yazgan, Taylan Yetkin)
 - Data validation (Kerem Cankocak, Sorina Popescu, Jeff Temple)
 - Databases: Meenakshi Nahrain,
in particular: online: Gennadiy Lukhanin, offline: Radek Ofierzynski



HCAL DQM@HLT



- Detailed plans are being discussed
- Monitor events before they are filtered by the HLT
- HCAL: plan to
 - watch ϕ asymmetry,
 - look for dead cells



HCAL Online DQM

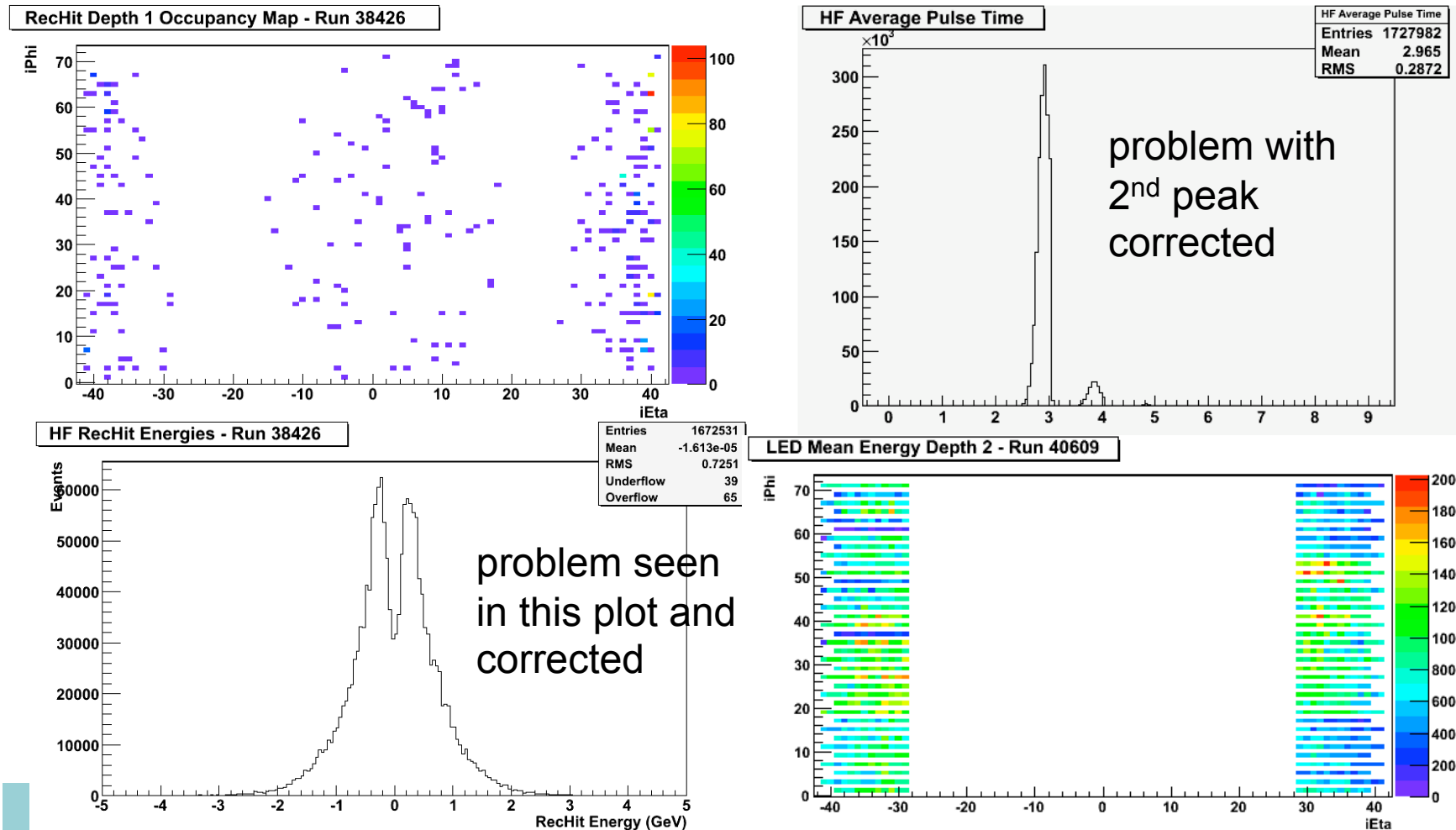


- Hcal DQM project:
<https://twiki.cern.ch/twiki/bin/view/CMS/HcalDQM>
- DQM Tasks:
 - Data Format: HTR and DCC data format sanity checks.
 - Digi Integrity: mapping, QIEs etc.
 - Dead Cells & Hot Cells: flag and map suspected dead and hot cells
 - LED Monitor: analysis of LED runs
 - Pedestals: ped. Means, widths and maps
 - Reconstructed Hits: occupancies, with and without thresholds, signal profiles
 - Trigger Primitives: TP Spectra, TP-vs-signal correlation, TP timing...
 - Calorimeter Towers: occupancy and energies of all the CaloTowers within an event.



HCAL Offline DQM

- Basically the same code as online DQM, just with different options.
- More detailed. Online: summary histograms, offline: channel-by-channel histograms.
- Running at CAF (viewed from CMS ROC)





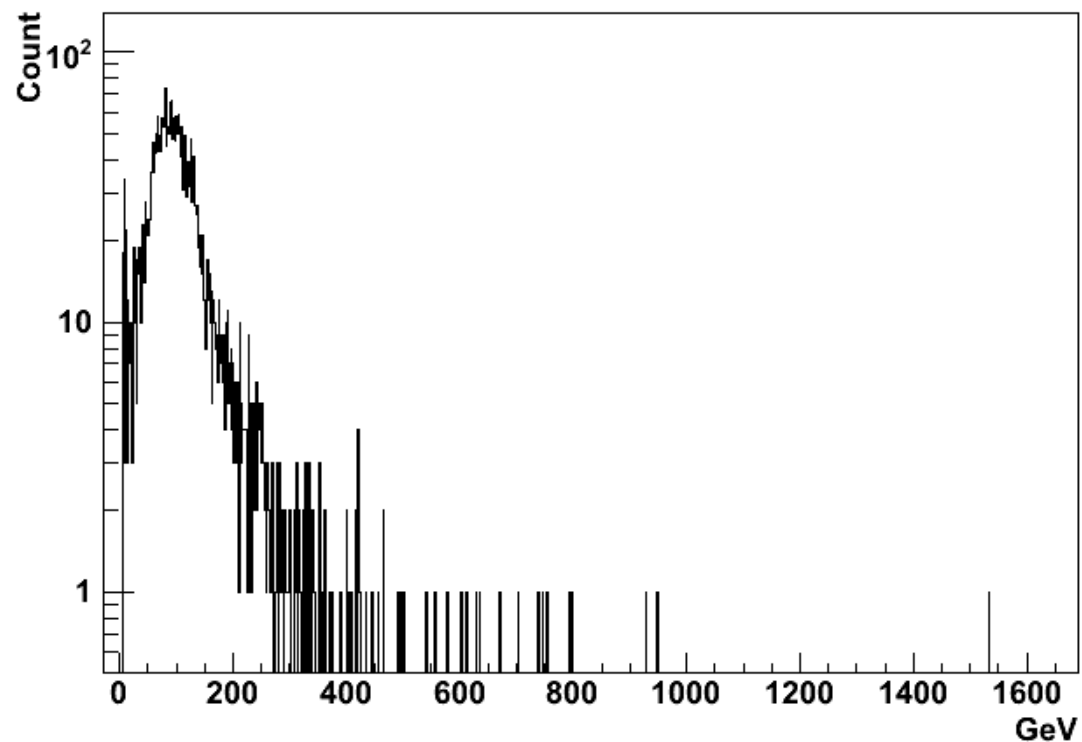
HCAL Prompt Analysis



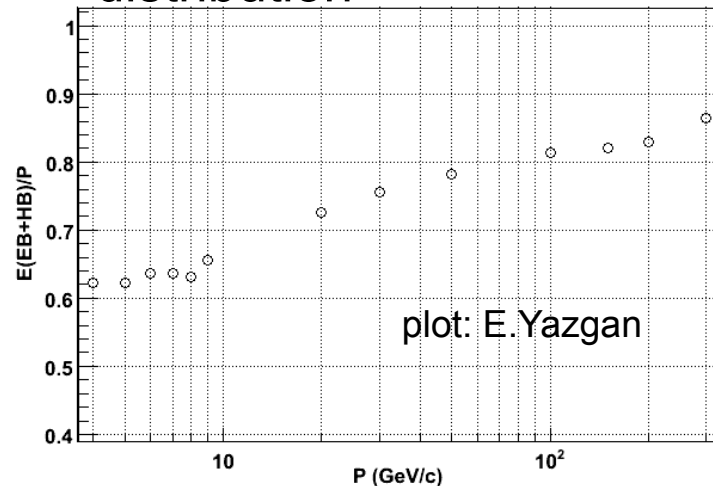
- Correlations between subdetectors – HCAL and ECAL, Muon systems, tracks, etc. (energy, momentum, space)
- Noise analysis (e.g. HPD noise, abnormal events in HF, missing E_T)

E.g. energy spectrum of pions (of 300 GeV/c) in HF photomultiplier tubes (PMTs) from TB07. Also helps to select some interesting events.
Plot: A. Hunt, E. Yazgan, V. Halyo, J. Freeman.

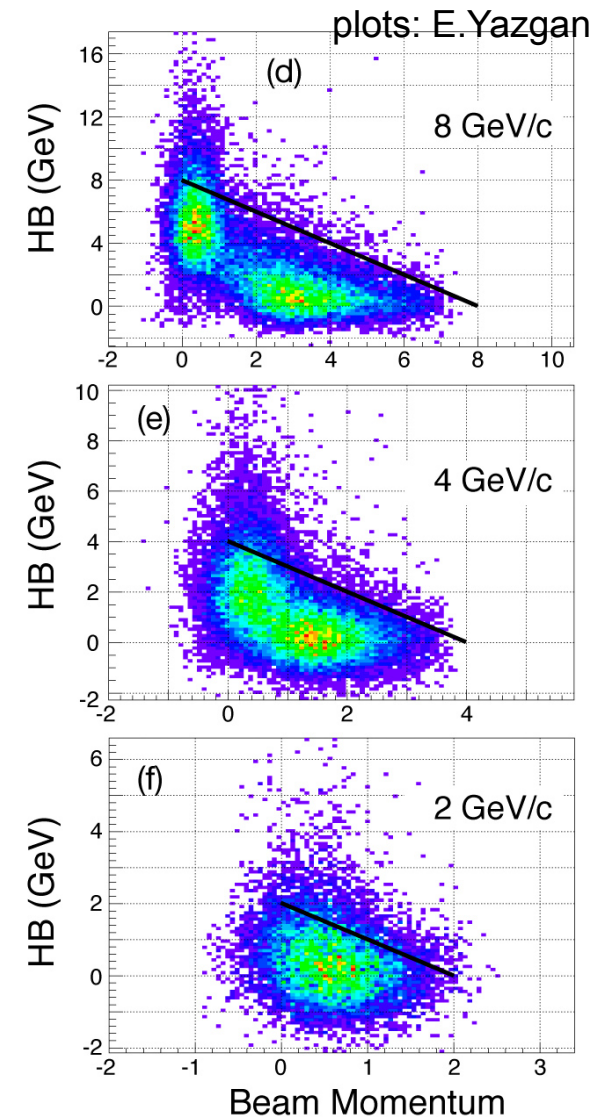
Top PMT Count - Pions



- Check calibration (response correction factor)
 - Resolution vs. momentum in energy ranges: E_H vs. p , E_{E+H} vs. p , E_H/E_{E+H} vs. p
 - Monitor homogeneity in energy ranges w.r.t. ϕ , E_H/p or $E_{\text{calotower}}/p$ vs. ϕ , η ,
 - Regions beyond tracker: focus on E_T
 - Input from IsoTrack, Di-jets, tau-triggers
 - CaloTower: E_T balance, ϕ asymmetry, η distribution

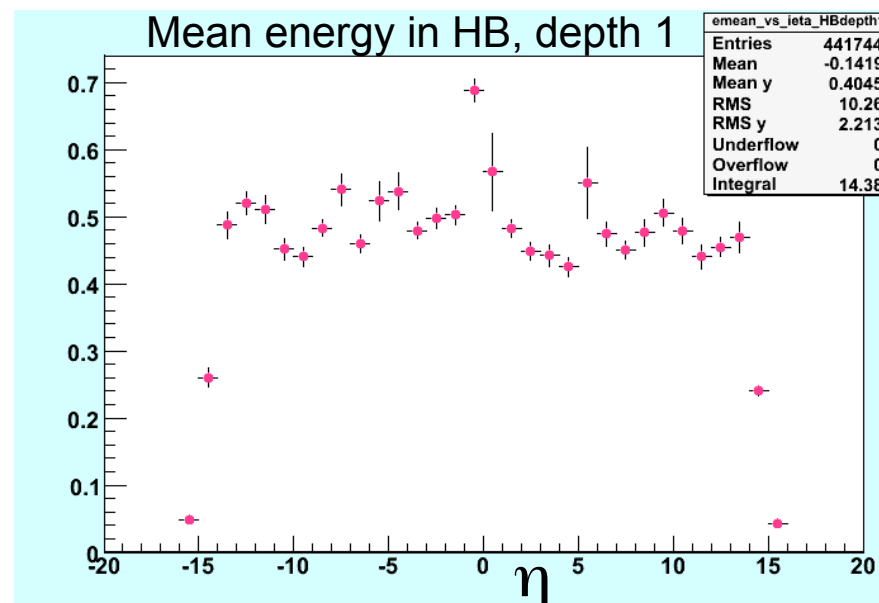
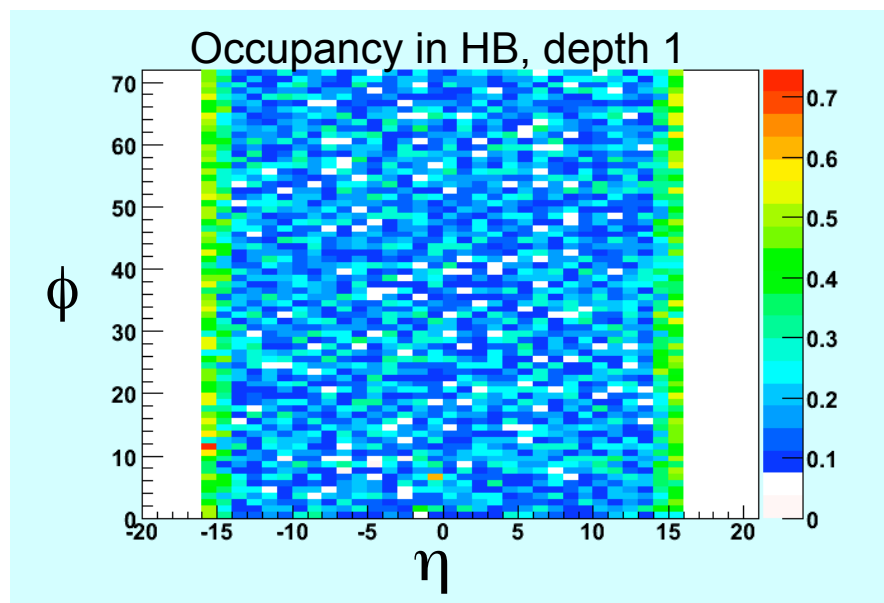


EB+HB over momentum vs. momentum for pions in TB06.



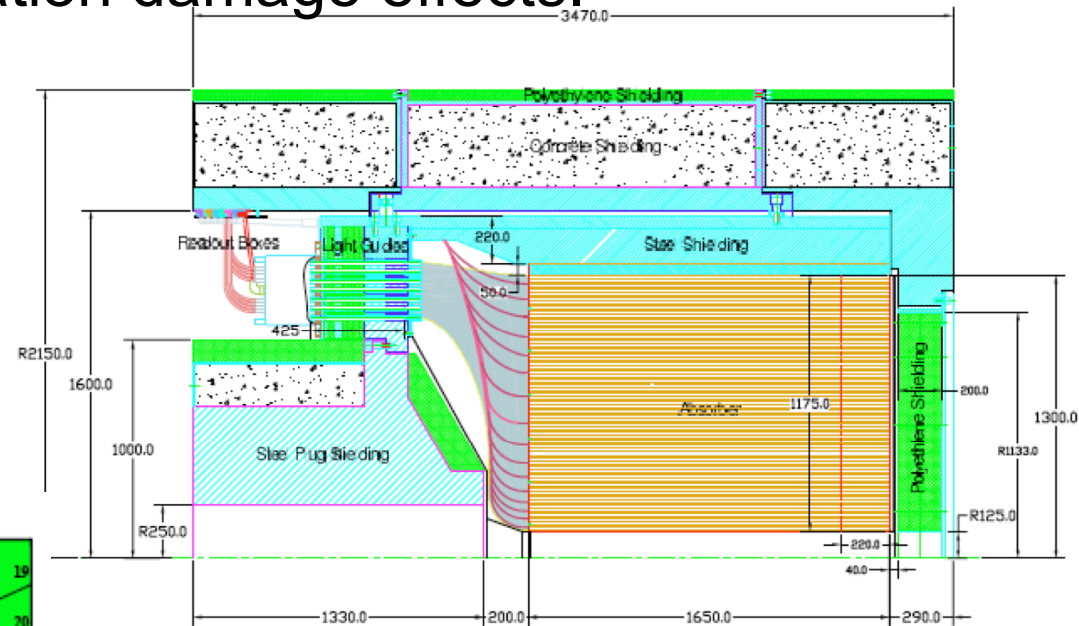
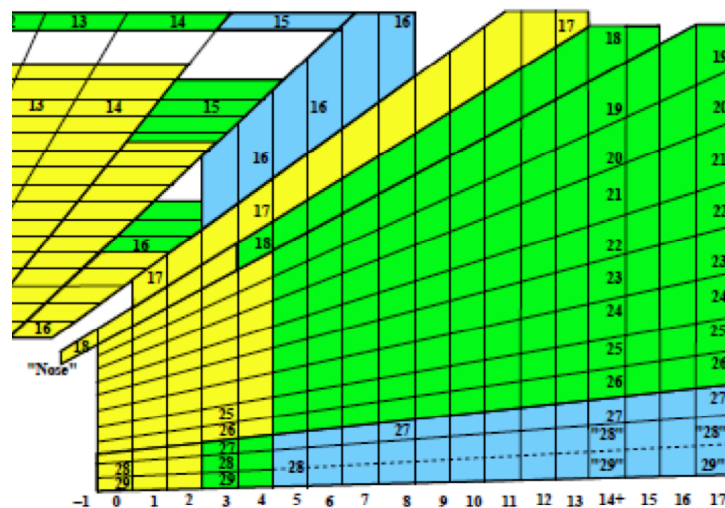
- Collect the information from different sources, e.g. prompt analysis, commissioning
- Exact plans under discussion
- For specific physics channels, watch occupancy and mean energies, e.g. for $t\bar{t}$ (from simulation)

plots: S.Abdouline



- Check mainly for radiation damage effects.

HF: look at ratio of long and short fibre response



HE: read ratio of the two depths



HCAL Conditions



- Pedestals determined online, checked and put into the databases
- Gains, QIE Data and electronics mapping stable unless hardware changes
- response correction factor (calibration):
 - monitored and computed at CAF
 - after validation, feed back into online
- channel status
 - determined partly online (trigger, lumi, quality information)
 - used online to e.g. mask channels
 - streamed to offline (prompt reco), where information e.g. for CaloTowers is added
 - if needed, manual feed back to online, e.g. if better algorithms determine better information for future runs (e.g. channel should be masked)



HCAL Channel Status Word



- 32-bit word:

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
											CALO TOWER			TRIGGER			LUMI			HPD NOISE			QUALITY			CALIBRA- TION			GO OD NE SS	ON / OF F	
											offline			online			online			offline			online								

- 0: on/off
- 1: good/bad (mask it or not)
- 2-4: Calibration: QIE, Response Correction
- 5-8: Quality: timing, stability, “hotness”
- 9-11: HPD noise (used by simulation)
- 12-14: Lumi
- 15-17: Trigger
- 18-20: Calo tower: see talk by A.Anastassov
- Status word delivered to JetMET



Summary



- Online/Offline DQM in good shape
- Work ongoing in the areas of DQM@HLT, prompt analysis, data validation
- First definition of channel status word, to be improved
- Determine the criteria for run summary from HCAL point of view

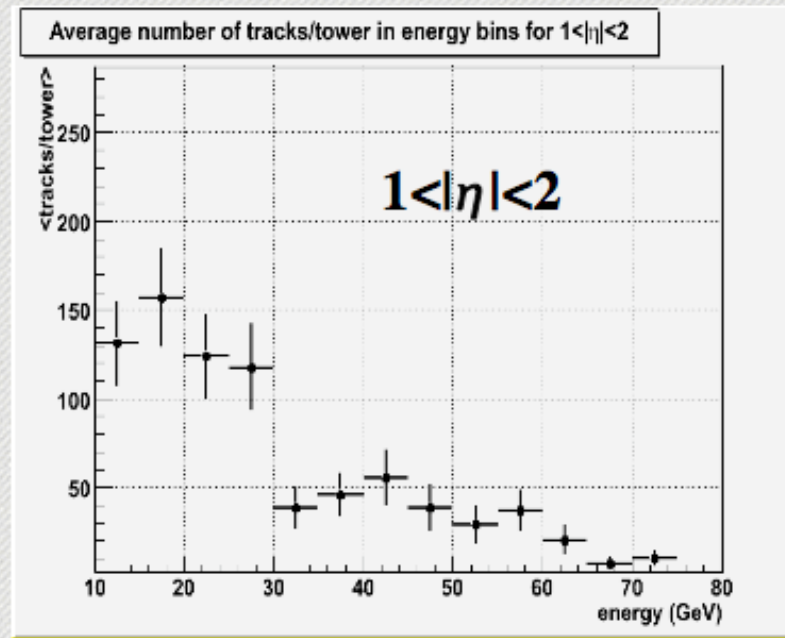
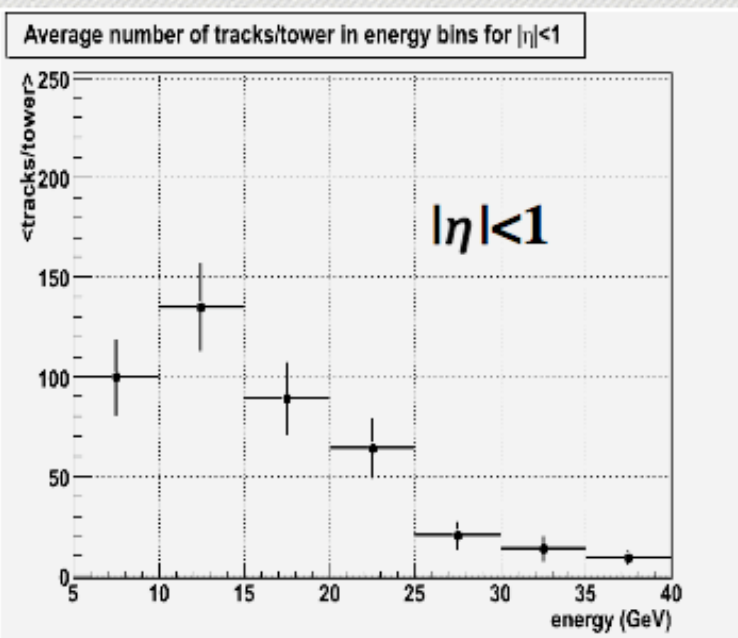


BACKUP

1 pb⁻¹ scenario

Estimation of statistics for 1 pb⁻¹ scenario

- L1_SingleJet30 was used at L1, rate at luminosity of 2e30 (iCSA08) is 3.12 kHz
- Offline tracks were cut at pT of 5GeV.
- Average numbers of energy binned isolated tracks per tower for two different eta regions are shown here.



10 pb⁻¹ scenario

Estimation of statistics for 10 pb⁻¹ scenario

- L1_SingleJet50 was used at L1, rate at luminosity of 2e31 (iCSA08) is **2.76 kHz**
- Offline tracks were cut at pT of 5GeV.
- Average numbers of energy binned isolated tracks per tower for two different eta regions are shown here.

